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ABSTRACT

The Test of English as a Foreign Language (TOEFL) was administered to 26 deaf students (approximately 18 years of age) to determine (1) whether deaf children of deaf parents (DP), as users of American Sign Language and as possessors of a shared code, would outperform deaf children of hearing parents (HP); (2) whether the performance of DP subjects, if they do learn English as a second language, would resemble the performance of hearing, foreign students on their item-by-item performance; and (3) whether the performance of DP subjects on the TOEFL test and on the Stanford Achievement Test (SAT) would be less related than the performance of HP subjects. Results showed that the DP group was superior to the HP group of three of the four TOEFL subtests and on two SAT subtests and that the parentage variable accounted for 53 percent of the variance in total test scores. The item-by-item comparisons showed the DP group performance to more like that of the hearing, foreign students than was the performance of the HP group. Whereas the correlations of the Paragraph Meaning SAT subtest scores with the TOEFL scores failed to discriminate between the DP and HP subjects, the DP subjects' scores correlated better than HP group scores on the Language subtest of the SAT. (HOD)

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ENGLISH AS THE SECOND LANGUAGE OF DEAF STUDENTS

by

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ENGLISH AS THE SECOND LANGUAGE OF DEAF STUDENTS[1]

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Education for hearing impaired, or 'deaf', students centers on language skills such as speech, vocabulary, composition, grammar, reading, speech-reading, and, in high school, remedial English. In spite of this emphasis upon their presumed native language, the deaf, in numerous measures of English language ability, consistently score lower than hearing controls (Goetzinger & Rousey, 1959; Miller, 1958; Moores, 1970). In tests of writing ability, deaf subjects evince large vocabulary deficits relative to hearing subjects (Templin, 1966, 1967), and the grammatical correctness and complexity of their writings are far below those of hearing controls (Dunagan, 1969; Marshall & Quigley, 1970; Stuckless & Marks, 1966).

It is doubtful that this language deficit can be ascribed to a more general cognitive deficit (Furth, 1964). Recent reviews of the literature challenge earlier claims of a cognitive deficit and strongly indicate that the distribution of intelligence is similar for deaf and hearing populations (Bonvillian & Charrow, 1972; Mindel & Vernon, 1971; Vernon, 1967, 1968). An alternative to the cognitive deficit explanation is that English is not the native language of the prelingually deaf child and that he learns English as a second language.

In the case of the deaf child of deaf parents, this explanation seems quite plausible. His first language may be American Sign Language

(ASL), or Ameslan (Fant, 1972), learned from his parents who are likely to be fluent signers. Signs do not necessarily bear a one-to-one relationship to English vocabulary, and the syntax of ASL is radically different from the syntax of English (McCall, 1965; Stokoe, 1960, 1971). Therefore, the deaf child of deaf parents may experience difficulties in learning English that are similar to those encountered by anyone learning English as a second language.

In the case of the deaf child of hearing parents, the second language explanation seems less plausible. Until he enters a school for the deaf, learns signs from his peers, and is taught English, a deaf child of hearing parents may have no native language in the strict sense of a code shared by many users. The deaf child of hearing parents may devise a set of idiosyncratic gestures that communicate basic needs and ideas to his parents, but his vocabulary and grammar will have little in common with anyone other than his parents. If one assumes with Lenneberg (1967) and others that the optimal time for learning language ends at an early age, one might expect the deaf child of hearing parents, because he has no common first language as a basis, to encounter even more difficulties in learning English than the deaf child of deaf parents. This assumption is supported by Meadow (1968) who found the reading ability of deaf children of deaf parents to be superior to that of deaf children of hearing parents.

That the prelingually deaf child learns English as a second language is supported by observations of educators of the deaf (Stokoe, 1971) and of deaf people themselves (Williams, 1968). However, no empirical studies have been undertaken to substantiate these observations. A natural

design for such an investigation is to administer a test of English as a second language to prelingually deaf subjects divided into two groups, deaf children of hearing parents and deaf children of deaf parents. Performance by the two groups on the test can then be compared with each other, with the performance of hearing subjects for whom English is a foreign language, and with the performance of the two groups on standard English skills.

This design was used in the present study to investigate three general hypotheses. First, deaf children of deaf parents, as users of ASL and as possessors of a native language in the sense of a shared code, should outperform deaf children of hearing parents on any test involving language skills and, particularly, on a test of English as a second language. Second, if deaf children of deaf parents learn English as a second language, their item-by-item performance on a test of English as a second language should resemble the performance of foreign students taking the test more than the performance of deaf children of hearing parents. Third, performances by deaf children of deaf parents on a test of English as a second language and on a standard test of English skills should be less related than performances by deaf children of hearing parents on the two tests.

Procedure

An appropriate standardized test of English, the Test of English as a Foreign Language (TOEFL) published by Educational Testing Service (ETS) of Princeton (1970), was administered to 26 students at the California School for the Deaf in Berkeley, California.

The manual for the TOEFL describes it as a test of English proficiency divided into five parts, each measuring an important language skill: Listening Comprehension, English Structure, Vocabulary, Reading Comprehension, and Writing Ability. The test was reviewed by Chase and Domino in Buros (1972). Both reviews questioned the utility of the separate subtests as reliable sources of diagnostic information because of substantial intercorrelation between them. On the other hand, both reviews indicated that the TOEFL demonstrates sufficient concurrent validity when other measures of English proficiency are used as criteria.

Another aspect of the TOEFL is its construct validity; it should discriminate between individuals for whom English is a second language and those for whom English is a native language. Angoff and Sharon (1971) administered the TOEFL to 71 American undergraduates who scored below the 30th percentile on the American College Testing Program (ACT) English Test. These students achieved scores on the TOEFL that were far above those observed for foreign students, and many earned maximum or near-maximum scores. All but 17 items on the TOEFL were easier for the American students than for foreign students. Further, the correlation of ACT scores with TOEFL scores in the Angoff and Sharon data was only .64. As the TOEFL manual indicates, this correlation is fairly low for two reliable tests measuring the same skill. The implication of the Angoff and Sharon study is that the TOEFL measures language skills different from those in the ACT English Test and that these different skills are particularly relevant to individuals who must learn English as a second language.

In administering the TOEFL to the deaf subjects all references to English as a foreign language in the directions and on the printed portion of the test were omitted. It was presented simply as a test of English. The Listening Comprehension subtest was omitted from the test administration. The standardized test instructions were given in Signed English, or sign language with English word order (Fant, 1972), which is the normal medium for classroom instruction at the school. Additionally, the sample questions for the TOEFL were written on a blackboard, signed, and fingerspelled. Responses to the sample questions were elicited from all the subjects who were allowed to begin each subtest only after they had demonstrated an understanding of both the directions and the sample questions. Because extra time was required to present the instructions to the deaf subjects, a lunch break was permitted between the Reading Comprehension and Writing Ability subtests. The test was graded by ETS and the TOEFL data for this study were the transformed scores ordinarily used by ETS in reporting TOEFL results. These scores are scaled to a distribution with a mean of 50 and a standard deviation of 10.

Additionally, grade placement scores from the Stanford Achievement Test (SAT) Paragraph Meaning (PM) and Language (L) subtests were available for all 26 subjects and were used in this study. According to the SAT manual (Kelley, Madden, Gardner, and Rudman, 1964), the PM subtest measures subjects' ability to comprehend and draw references from connected written discourse and the L subtest measures subjects' proficiency in usage, punctuation, capitalization, dictionary skills, and sentence sense.

Subjects

The subjects for this study were 13 children (5 females and 8 males) of hearing parents (HP) and 13 children (4 females and 9 males) of deaf parents (DP). All subjects in the DP group and 10 subjects in the HP group were congenitally deaf. Three HP subjects were identified as deaf at 18 months of age. Hearing loss for all subjects in the experiment was at least 65 db in the better ear in the 500 to 2,000 frequency range. In order to assign a numerical value to the hearing loss experienced by all the subjects, a value of 115 db was arbitrarily assigned to subjects whose hearing loss had been diagnosed as total. The mean age over all subjects in the experiment was 17 years and 9 months, which is comparable to the normal age for college entrance in the United States. However, the average age of the HP subjects was significantly higher than that of the DP subjects. Table 1 displays the means and standard deviations of age, WISC Performance IQ, and hearing loss for the two groups of subjects.

Results and Discussion

Comparisons of the HP and DP groups' performance on the TOEFL are shown in Table 2, together with means and standard deviations for a standard group of 113,975 hearing, foreign students who took the TOEFL between February 1964 and June 1966. These standard data were taken from the TOEFL manual (Test of English, 1970, p. 6).

The most striking aspect of these data is the clear superiority shown by the DP students over the HP students in the English Structure, (ES), Vocabulary (V), and Writing Ability (WA) subtests and in total test performance. It is doubtful that this superiority was due to

Table 1

Means, Standard Deviations, and T Scores for Differences in Age, IQ, and Hearing Loss for the 13 HP and the 13 DP Subjects

	Group	Mean	S.D.	T
Age in months	HP	219.38	11.30	-2.44*
	DP	206.15	15.78	
WISC Performance IQ	HP	111.92	10.65	.14
	DP	112.54	11.51	
Average hearing loss in better ear[a]	HP	103.46	8.01	.00
	DP	103.46	12.97	

[a]Hearing loss was measured at 500, 1,000, and 2,000 cycles per second.

$*p < .05$, $df = 24$.

Table 2

Means, Standard Deviations, and *T* for TOEFL Scores of 13 HP, 13 DP and 113,975 Foreign Students (S)

	Group	Mean	S.D.	*T* score
	HP	28.15	3.69	
English Structure (ES)	DP	39.85	6.36	5.74*
	S[a]	49	8	
	HP	34.92	5.11	
Vocabulary (V)	DP	43.85	6.09	4.05*
	S	48	11	
	HP	34.15	2.12	
Reading Comprehension (RC)	DP	30.31	5.02	-.59
	S	48	8	
	HP	31.00	3.39	
Writing Ability (WA)	DP	38.54	6.72	3.62*
	S	48	8	
	HP	128.23	10.69	
Total Score (T)	DP	159.54	19.04	5.17*
	S[b]	--	--	

[a]Means and standard deviations for foreign students were taken from the TOEFL manual (Test of English, 1970, p. 6).

[b]Distribution of total scores for foreign students across the four subtests was not available.

*$p < .01$, df = 24.

socioeconomic differences between the groups. Reports from the school indicate that, if anything, the DP subjects came from lower socioeconomic backgrounds than did the HP subjects. It is also doubtful that this superiority was due to factors related to personality adjustment. Although Meadow (1968) concluded that the social functioning of her DP subjects was superior to that of her HP subjects, both Stuckless and Birch (1966) and Vernon and Koh (1970) reported no significant differences in the personality adjustment of students who had used manual communication before attending school and students who had not.

Table 2 also shows that means for both the HP and DP groups are well below those for the 113,975 subject population reported by ETS. The deaf students are clearly at a disadvantage when compared with students for whom English is a foreign language, and this disadvantage is greater for deaf children of hearing parents than for deaf children of deaf parents.

Comparisons of the HP and DP groups' performance on the two SAT subtests are shown in Table 3. The DP group scored significantly higher than the HP group on both the Paragraph Meaning (PM) and Language (L) subtests. These results together with those in Table 2 amplify earlier findings by Meadow (1968) who reported significantly superior performance by DP subjects over HP subjects on SAT reading and arithmetic subscores.

Point biserial correlations were calculated for the binary parentage variable, which was arbitrarily assigned the value 0 for deaf parents and 1 for hearing parents, with the English Structure (ES), Vocabulary (V), Reading Comprehension (RC), and Writing Ability (WA) TOEFL subtest scores, with total TOEFL score (T), with the Paragraph Meaning (PM) and Language

Table 3

Means, Standard Deviations, and *T* for SAT Grade Placement Scores of 13 HP and 13 DP Students on the Paragraph Meaning (PM) and Language (L) Subtests

	Group	Mean	S.D.	*T*-score
Paragraph Meaning (PM)	HP	4.92	1.07	-3.64**
	DP	7.04	1.80	
Language (L)	HP	6.65	2.49	-2.47*
	DP	8.64	1.48	

*$p < .05$, df = 24.

**$p < .01$, df = 24.

(L) SAT subtest scores, and with age, Weschler Intelligence Scale for Children Performance, IQ, and average hearing loss (HL) in the better ear. These correlations are reported in Table 4. As might be expected from the significant difference in age reported for the HP and DP groups in Table 1, age correlates significantly with the parentage variable. This correlation may reflect school policy. Students often continue at the school until they qualify for admission to college or they reach a maximum age. Students, such as the HP students who experience difficulties with English, are likely to remain at the school longer. Correlation of parentage with IQ and hearing loss is effectively zero as we might expect it to be.

An interesting aspect of the Table 4 data obtains from the negative correlations of the parentage variable with the TOEFL and SAT scores. The correlations are negative because we assigned a parentage value of 0 to the DP group and 1 to the HP group, but the magnitudes of the correlations are notable. It is significant that the parentage variable accounts for over 53% of the total TOEFL score variance, and that it even accounts for 15% of the RC subtest-score variance. The superior performance of the DP students over the HP students reported in Table 2 is corroborated by the Table 4 correlations. The data in Table 4 are useful because they provide numerical estimates of the importance of the parentage variable in accounting for TOEFL performance.

Table 5 continues the correlational analyses. These data constitute a matrix of simple intercorrelations for the TOEFL subtests, total TOEFL score (T), age, IQ, hearing loss (HL), and a 0,1 variable for sex of the subject. Zero was arbitrarily assigned to females and 1 to males. Each entry in the table comprises a pair of numbers--the upper number is the

Table 4

Point Biserial Correlations for Parentage (DP = 0, HP = 1) with TOEFL and SAT Scores, Age, IQ, and Hearing Loss Calculated for All 26 Deaf Subjects

	Parentage
English Structure (ES)	-.76**
Vocabulary (V)	-.64**
Reading Comprehension (RC)	-.39*
Writing Ability (WA)	-.59**
Total TOEFL (T)	-.73**
Paragraph Meaning (PM)	-.60**
Language (L)	-.45*
Sex	-.08
Age	.45*
IQ	-.03
Hearing Loss (HL)	.00

*Significant F Test for regression, $p < .05$, df = 1,24.

**Significant F Test for regression, $p < .01$, df = 1,24.

Table 5

Matrix of Intercorrelations Between TOEFL Scores, Age,

IQ, Hearing Loss, and Sex (Female = 0, Male = 1)

	ES	V	RC	WA	T	SEX	AGE	IQ	HL
ES	1.00	.73[a]** .76[b]** (.72)[c]	.24 .35 (.66)	.52 .62* (.79)	.91** .89	-.10 -.43	.49 -.30	-.08 .72**	.35 .48
V		1.00	-.03 .64* (.69)	.37 .39 (.76)	.84** .88**	-.17 -.42	.52 -.48	-.22 .54	.30 .23
RC			1.00	.14 .13 (.72)	.31 .63*	.14 .04	-.21 -.20	.25 -.39	.02 -.17
WA				1.00	.70** .72**	.19 .03	.79** -.08	-.23 .73**	.34 .33
T					1.00	-.03 -.25	.62* -.34	-.15 .77**	.37 .31
SEX						1.00	-.06 .36	.60* -.08	-.26 -.15
AGE							1.00	-.62* -.24	.62* -.19
IQ								1.00	-.73** .51
HL									1.00

Table 5 (cont'd)

[a]Upper entries are for the 13 HP subjects.

[b]Second entries are for the 13 DP subjects.

[c]Lower entries in parentheses are for foreign students and are taken from the TOEFL manual (Test of English, 1970, p. 4).

*Significant F Test for regression, $p < .05$, $df = 1,11$.

**Significant F Test for regression, $p < .01$, $df = 1,11$.

correlation obtained within the HP group and the lower number is the correlation obtained within the DP group. There are additional entries in parentheses for the subtest intercorrelations; these are the correlations reported by the TOEFL manual for hearing subjects (Test of English, 1970, p. 14).

In general, the intercorrelation among the TOEFL subtests indicate that they measured distinct abilities. One possible exception to this rule is the subtest pair composed of the English Structure (ES) and the Vocabulary (V) subtests. Correlations between these two subtests were fairly high and to some extent they may have measured the same abilities in the two groups of deaf subjects.

Correlations with the sex variable obtained from the HP group are nearly all small. It seems safe to conclude that the subjects' sex did not account for any significant portion of the TOEFL score variance.

The two negative correlations for age and IQ are indicative of the school practice of releasing students when they are ready for college. Older students in the HP group scored lower on the IQ measure and experienced greater hearing loss than did younger students, but there are fairly high positive correlations for the HP students between age and the WA and total TOEFL scores. If we assume that age reflects how long the students have been in school, the simplest explanation for these data is that the school is doing the students considerable, measurable good. The DP students meet criteria for college admission sooner and the effect of the extra schooling is not observable in their data.

The extra schooling effect in the HP group probably explains the low correlations observed in this group for IQ-subtest comparisons.

The fairly high negative correlation of IQ with hearing loss was expected and has been reported by other investigators. The correlations for the DP group with IQ are another matter, however. Fairly high positive correlations were observed in this group for IQ with ES, WA, and total TOEFL scores. The implication of these data is probably that the extra schooling is not as important a variable for the DP group's TOEFL performance as it is for the performance of the HP group.

The technique of stepwise multiple regression, assuming intrinsically linear relationships between dependent and independent variables, is also useful in determining how the variables of sex, age, IQ, hearing loss, and parentage are related to TOEFL scores. The basic model for the multiple regressions used in this study is the following:

$$E(S_i) = \alpha_0 + \alpha_1 \, SEX_i + \alpha_2 \, AGE_i + \alpha_3 \, IQ_i + \alpha_4 \, HL_i + \alpha_5 \, P_i$$

where S_i denotes a TOEFL score, and the α_i $(i = 0,\ldots,5)$ are parameters of the model. In stepwise regression the order in which independent variables are entered into the model is of interest because it can indicate the relative importance of the independent variables. Results from the stepwise multiple regressions performed in this investigation are reported in Table 6. Multiple correlation coefficients and independent variables are reported for each step in the five regressions performed--one regression for each subtest plus one for total TOEFL score. The parentage variable is represented by P.

As might be expected, the parentage (P) variable was clearly the most important of the five independent variables in accounting for variance in the dependent variable in all five regressions. It was the

Table 6

Stepwise Multiple Regressions for All 26 Subjects with

TOEFL Scores as Dependent Variables

	ES		V		RC		WA		T	
Step number	Variable	R	Variable	R	Variable	R	Variable	R	Variable	R
1	P	.76	P	.64	P	.39	P	.59	P	.73
2	HL	.81	SEX	.68	IQ	.49	IQ	.68	IQ	.79
3	IQ	.85	IQ	.72	HL	.51	AGE	.73	SEX	.82
4	SEX	.89	HL	.73	SEX	.52	HL	.76	AGE	.84
5	AGE	.90	AGE	.74	AGE	.52	SEX	.77	HL	.85

first variable entered in every case and by itself accounted for 15% to 58% of the variance in the dependent variable. Also significant was IQ which was the second variable entered in the regressions using RC, WA, and total scores as the dependent variables and the third variable entered into the regressions onto ES and V subtest scores. Beyond the significance of these two variables, there seems to be little systematic information to be gained from these multiple regressions. In general, they are consistent with the results reported in Tables 4 and 5.

A final aspect of the multiple regressions worth noting is that in all five regressions, when the residuals were plotted against the observed values for the dependent variable, an obvious linear effect occurred. Such scatter plots should be roughly horizontal; ours were not, and clearly indicated that our models overestimate large values of the dependent variable and underestimate small values of the dependent variable. Evidently, an important independent variable was missing from these data.

One major hypothesis for this investigation was that deaf children of deaf parents, as users of ASL and as possessors of a native language in the sense of a shared code, should out-perform deaf children of hearing parents on any test involving language skills in general. This hypothesis was supported by the preceding data which showed significantly superior performance by DP subjects on both SAT subtests and on three of the four TOEFL subtests. Further, these data demonstrated the primary importance of the parentage variable in regression models of the subjects' test performance.

The second major hypothesis was that the item-by-item performance by DP subjects on the TOEFL should resemble the performance of hearing, foreign students for whom English is a second language more than the performance by HP subjects. Two analyses in support of this second hypothesis were undertaken. First, a comparison based on the number of correct answers to each item; and second, a comparison based on the most likely wrong answer to each problem. One analysis was undertaken for each of the four TOEFL subtests used in this study, and within each analysis four groups of subjects were considered--a standard group (S) of 495 foreign students for whom item analysis results were available, 26 subjects (C) comprising all the deaf subjects used in this study, the 13 deaf children of hearing parents (HP), and the 13 deaf children of deaf parents (DP).

The correlations from the correct answer analysis are given in Table 7. The model for these regressions is of the form

$$E(S_i) = \alpha_0 + \alpha_1 G_i$$

where S_i is the number of correct answers obtained on item i by the 495 member S group, G_i is the number of correct answers obtained on item i by members of the group being considered (C, HP, or DP), and the α_i (i = 0,1) are parameters of the model.

The correlations from the wrong-answer analysis are given in Table 8. The model for these regressions is of the form

$$E(S_i) = \alpha_0 + \alpha_1 G_i$$

where S_i is the number of answers made by the 495 subject group on the wrong answer choice to item i that attracted the greatest number of

Table 7

Intercorrelations for Item-by-item Number of Correct Answers Scored by 495 Foreign Students (S), all 26 Deaf Subjects (C), the 13 HP Subjects, and the 13 DP Subjects on the Four TOEFL Subtests

	ES[a]					V[b]					RC[c]					WA[d]		
	S	C	HP	DP		S	C	HP	DP		S	C	HP	DP		S	C	HP	DP
S	1.00	.66*	.44*	.68*	S	1.00	.66*	.53*	.65*	S	1.00	.25	.11	.29	S	1.00	.62*	.50*	.61*
C		1.00	--	--	C		1.00	--	--	C		1.00	--	--	C		1.00	--	--
HP			1.00	.53*	HP			1.00	.65*	HP			1.00	.51*	HP			1.00	.58*
DP				1.00	DP				1.00	DP				1.00	DP				1.00

*Significant F Test for regression ($p < .01$).

[a] df = 1,68

[b] df = 1,58

[c] df = 1,28

[d] df = 1,58

responses, G_i is the number of wrong answers attracted by the choice indicated in the S_i group for item i by the group under consideration (C, HP, or DP), and the α_i (i = 0,1) are parameters of the model.

If the second hypothesis is true, then item correlations of the S group with the DP group should be larger than the correlations of the S group with the HP group. This result is evident in Table 8 as well as in Table 7, and it seems reasonable to conclude that the item-by-item performance of the DP group more closely resembles the performance of the hearing S group than does the HP group. The implication is that English, in some sense, is more of a second language for the DP group than it is for the HP group.

On first glance, then, the correct-answer and most likely wrong-answer correlations support the second hypothesis. There are, however, some ambiguous results in these correlations. This hypothesis would predict higher correlations between the S group and the DP group than between the DP group and the HP group. This result is evident in the correlation matrices for the ES and WA subtests in both Tables 7 and 8, but it is not evident in the correlation matrices for the V and RC subtests. Certainly, the opposite is the case for the RC subtest. Performance by both groups of deaf subjects is essentially random with respect to the standard group of hearing, foreign students and it is significantly similar for the HP and DP groups. Evidently, the RC subtest measured, to some extent, the same thing in the two groups of deaf subjects, and it measured something quite different in the standard group of hearing subjects.

Table 8

Intercorrelations for Item-by-item Number of Responses to the Most Likely Wrong Answer Made by 495 Foreign Students (S), All 26 Deaf Subjects (C), the 13 HP Subjects, and the 13 DP Subjects on the Four TOEFL Subtests

	ES[a]					V[b]					RC[c]					CA[d]			
	S	C	HP	DP		S	C	HP	DP		S	C	HP	DP		S	C	HP	DP
S	1.00	.36*	.10	.48*	S	1.00	.40*	.28	.43*	S	1.00	-.04	.01	-.09	S	1.00	.32	.12	.40*
C		1.00	--	--	C		1.00	--	--	C		1.00	--	--	C		1.00	--	--
HP			1.00	.42*	HP			1.00	.67*	HP			1.00	.48*	HP			1.00	.31
DP				1.00	DP				1.00	DP				1.00	DP				1.00

*Significant F Test for regression ($p < .01$).

[a] df = 1,68

[b] df = 1,58

[c] df = 1,28

[d] df = 1,58

Because deaf students are poorer readers than are hearing students of comparable ages (Furth, 1966) and because the RC subtest was designed to measure reading ability ranging from that of college undergraduates to doctoral students, it probably has different validity for deaf and hearing students. The deaf student's knowledge of the world is limited by his reading deficit, and he may lack the necessary experience to cope with difficult reading passages. Less difficult passages may reveal more similarities between deaf and foreign students than the RC subtest did.

A further investigation seemed appropriate for the correct-answer and most likely wrong-answer analyses. Where the F Test for regression was significant, it appeared reasonable to examine the residuals and identify items that were significantly easier or significantly harder for the S group than the HP group, for the S group than for the DP group, and for the HP group than for the DP group. Although a number of appropriate items were identified, no linguistically reasonable commonalities or distinctive features among the items were found. For every reasonable example there appeared an equal and opposite counterexample. The major impression gained from this effort, aside from the extreme complexity of it, was that the foreign students seemed more facile with what could be called 'literary' English, and that the deaf students appeared more facile with text that resembled 'spoken' English.

The third major hypothesis implied that performances by DP subjects on the TOEFL and SAT subtests should correlate more poorly than should performances by HP subjects on the same tests. These correlations are presented in Table 9. The hypothesis is well supported by correlations between the TOEFL and Language test scores. With the exception of the

Table 9

Intercorrelations between TOEFL and SAT Subscores

for the 13 HP and the 13 DP Subjects

	Group	Paragraph Meaning (PM)	Language (L)
English Structure (ES)	HP	.81**	.79**
	DP	.84**	.30
Vocabulary (V)	HP	.63*	.67*
	DP	.84**	.30
Reading Comprehension (RC)	HP	.00	.18
	DP	.58*	.26
Writing Ability (WA)	HP	.51	.69**
	DP	.64*	.45
Total (T)	HP	.74**	.85**
	DP	.93**	.48

*Significant $\underline{F}$ Test for regression, $p < .05$, df = 1,11.

**Significant $\underline{F}$ Test for regression, $p < .01$, df = 1,11.

RC subtest in which both correlations were essentially zero, the correlations of the HP subjects' Language scores with TOEFL scores were much larger than were similar correlations for the DP subjects' scores. This result is not evident, however, in the correlations of TOEFL with Paragraph Meaning scores. In every case these correlations are higher for the DP subjects than for the HP subjects. With respect to the third hypothesis, then, the results are mixed. The SAT Language subtest appeared to measure something different among the DP subjects than the TOEFL did, and it appeared to measure the same thing among the HP subjects as the TOEFL did. The Paragraph Meaning subtest appeared to measure the same abilities among both the DP and HP subjects as did the TOEFL.

Conclusions

The DP group was clearly superior to the HP group on three of the four TOEFL subtests and on the two SAT subtests, despite the advantage of age and extra schooling in the HP group. The parentage variable accounted for 53% of the variance in total test scores, and the indicated importance of parentage was corroborated by stepwise multiple regression which entered it first in all the multiple regressions performed in the study.

Item-by-item comparisons within the TOEFL subtests for number of responses to the correct-answer choice and to the most likely wrong-answer choice in a standardization group of hearing, foreign students showed the DP group performance to be more like that of the standardization group than was the performance of the HP group. For the ES and WA subtests, these comparisons also showed that the performance of the DP group resembled the performance of the standardization group more

than it resembled the performance of the HP group; this result was not evident in the comparisons for the V and RC subtests. For that matter, the RC subtest appeared to measure something quite different among the standardization group than it did among the deaf subjects.

An effort to identify linguistically reasonable commonalities or distinctive features among items that were significantly harder or significantly easier for the deaf subjects than for the hearing subjects proved futile.

The DP subjects' scores on the Language subtest of the SAT were poorly correlated with their TOEFL scores, but the HP subjects' scores on the Language subtest were fairly well correlated with their TOEFL scores. This result indicates that standard tests of English skills measure different abilities among DP subjects than among HP subjects who presumably are not as likely as DP subjects to be learning English as a second language. However, correlations of the Paragraph Meaning SAT subtest scores with the TOEFL scores were all fairly high and failed to discriminate between DP and HP subjects.

The results of this study suggest that deaf students learn English as a second language. The question remains open, however, and more sensitive measures must be devised to provide more conclusive results. The significantly better performance by the DP subjects on the TOEFL may be related to their early competence in ASL. If this is true, hearing parents of deaf children should learn sign language and use it to communicate with their deaf children. Studies of bilingualism by Lambert (1972) have shown no adverse effects in second-language learning and have shown numerous benefits. Delaying first-language learning until

school age appears to have a permanent negative effect on children's language capabilities (Lenneberg, 1967). Thus, even though the language learned by deaf children of hearing parents using oral means is English, very little English may be learned. A conscientious effort to teach deaf children ASL as a first language may be far more effective in producing later facility with language tasks.

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